

THE COURTSHIP BEHAVIOUR OF *MELITTOBIA AUSTRALICA* GIRAULT,
1912, (HYMENOPTERA: EULOPHIDAE)

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ABSTRACT

The courtship behaviour of *M. australica* Girault, 1912 is discussed in detail and compared with that of *M. acasta* (Walker, 1839) and *M. chalybii* Ashmead, 1892.

Members of the genus *Melittobia*, where both sexes are known, show such extreme sexual dimorphism that the males and females of a species are not readily associated. *M. australica* Girault, 1912 shows typical dimorphism having a dark female, normal in form for a eulophid and pale brown males with abbreviated wings, modified antennae, and without compound eyes. The male's scape is greatly enlarged, pyriform in shape being expanded distally and bearing a ventral groove capped distally by a flap-like pedicel (Plate 28, A). During courtship the female's antennal club is clasped in this groove.

On emergence males remained close to the developing pupae and were observed to wander over the pupae palpating them with their antennae. The males were not observed to feed and never leave the host cell in which they emerged. If a male encountered another, a brief excited tussel ensued, but rarely was any injury inflicted. This contrasts with records of *M. acasta* (Walker, 1839) and *M. chalybii* Ashmead, 1892. Graham-Smith (1919) working with *acasta* noted that the males emerged first and there were fights in which the weaker were mutilated or killed. He recorded one fight as lasting for an hour and rarely did he find more than one male in a host puparium. Balfour-Browne (1922) noted that in *acasta* the incidence of such fights declined as the females began to emerge. Buckell (1928) recorded the males of *chalybii* as being extremely pugnacious and fighting fiercely until one was killed. Schmieder (1933), however, observed that no duels of this intensity in *chalybii* occurred even when a number of males were confined together in close quarters.

The males of *australica* searched for females with their short wings upright and their antennae outstretched. They were readily able to distinguish between males and females and in many cases when mated females were encountered the male did not attempt courtship. However, as the ratio of mated to unmated females increased the incidence of attempted courtship with females increased. This was perhaps a response to reduced encounters with unmated females. Under natural conditions this situation would not arise as the females disperse soon after mating. Where males attempted courtship with

mated females the latter did not submit passively, but attempted to walk off as the male mounted, or tucked their antennae beneath their heads out of reach. Where the males were able to proceed with courtship, attempts at copulation brought about no response from the females, and the males dismounted.

Unmated females were observed to solicit the attention of males. It was common to observe three or four females standing around a male engaged in courtship palpating him with their antennae. When approached by males, unmated females submit passively and courtship proceeds as follows. The male mounted the female's dorsum and used his antennae to orientate facing in the same direction as the female. His fore tarsi grasped the female around the cervix just behind the head, his mid tarsi were swung forwards and held out to either side of the female's head, his hind tarsi were braced against the female's abdomen or hind legs. The female's antennal club was fitted into the ventral groove of the male's scape, the male's wings were folded flat where they remained throughout courtship and copulation, and his abdomen was arched with its tip resting on the female's dorsal abdomen at about the second gastral segment.

Courtship was a long and involved procedure which lasted for up to 15 minutes. It may be discussed under two headings, antennal rubbing and kicking.

ANTENNAL RUBBING: Antennal rubbing alternated with kicking and involved the up and down squeezing motion of the flap-like pedicel. This resulted in oscillation of the female's club within the scape groove of the male's antenna and this oscillation was observed to alternate between the left and right antennae. Initially this was of short duration, 5–6 seconds, but gradually increased up to 19–21 seconds towards the end of the courtship period. During antennal rubbing the mid tarsi which were held either side of the female's head were noted to tremble.

KICKING: At the end of each antennal rubbing period the mid tarsi were swung above the female's head and then down to the level of the middle of her eyes in one relatively slow motion. At this stage there was a pause of 1–2 seconds after which the mid tarsi were swung down suddenly and rapidly accompanied by a kick of the male's hind legs braced against the female. The kick resulted in jerking of the whole body of the male. The mid tarsi returned to their position on either side of the female's head and antennal rubbing began again. Kicking was vigorous at the start of courtship, but diminished in intensity with time.

COPULATION: Immediately before copulation antennal rubbing ceased. There followed two or three convulsive movements of the male's body accompanied by the up and down motion of his mid tarsi. The male moved backwards maintaining his grip upon the female's antennae so that her head was pulled backwards until her frons was horizontal. At this stage the male released his grip upon the female's antennae and moved backwards passing the tip of his abdomen over and under that of the female. The female opened her genital aperture and copulation, lasting 8–10 seconds, took place. During copulation the female remained with her frons horizontal and the male had the distal

scape of his antennae braced against the dorsum of the female about half way along her wings (Plate 28, C).

In those cases where the male persisted in courtship with a mated female her head did not remain with the frons horizontal after release of her antennae and she did not open her genital aperture. Attempts at copulation by the male were unsuccessful.

The male antennal modifications of *acasta* and *chalybii* were recorded by various workers to be used during courtship in a similar fashion to those of *australica*. There are detailed descriptions of both species, (*acasta* — Parker and Thompson, 1928; *chalybii* — Hobbs and Kronic, 1971) which can be compared with *australica* and significant differences may be noted.

In *acasta* the body of the female was held by the male's fore and mid legs while the hind legs were used to stroke her lateral thorax. The hind legs stroke the thorax rhythmically beginning slowly and finishing with an abrupt jerk. At the same time, possibly alternating with the above, antennal rubbing occurs. After 4–5 minutes the behaviour of the male changed. The wings were beaten rapidly between strokes of the legs. The movements of the legs changed to a dorsoventral direction and the tarsi vigorously rubbed the sides of the female's thorax. Antennal rubbing deviated becoming more animated and then the convulsive jerks as in *australica* occurred just before copulation.

Hobbs and Kronic (1971) suggest that the mating habits of *chalybii* and *acasta* are similar. Comparing their observations on *chalybii* with those of Parker and Thompson (1928) on *acasta* it appears that this suggestion has some merit. However, there are a few discrepancies and it is felt that no definite decision could be made until standardised and more detailed observations on the two species are available.

Both differ in this behavioural aspect from *australica*. Such differences would presumably act as a reproductive isolating mechanism although it is a little difficult to find a reason for this necessity. *M. australica* is the sole species recorded from Australia whereas *acasta* and *chalybii* occur together in the Neotropics. Even so the males do not leave the host cell in which they emerge and the females are fertilised before they leave. Flanders (1943) adds another point of confusion by stating that within the genus *Melittobia* two different species may court and mate. Perhaps a much needed revision of the genus plus standardised and more detailed observations on the biology of the group may shed more light on the subject.

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